

The airway wall as a barrier against inhaled environmental particles: Protection mechanisms and health effects

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A number of epidemiological studies give evidence that the inhalation of fine particles (0.1-2.5µm) and nanoparticles (< 0.1µm) may cause increased pulmonary morbidity and mortality (Pope *et al.*, 1995; Schulz *et al.*, 2005). Of great interest are nanoparticles which, according to recent epidemiologic studies, are particularly toxic (Peters *et al.*, 1997). A series of structural and functional barriers exists in the airway and alveolar wall which protects the respiratory system against harmful and innocuous particulate material (Nicod, 2005). So far, little is known about the interaction of nanoparticles with lung cells, how they cross the epithelial barrier and how they may be transported through the blood stream to other organs. Using a triple cell co-culture model of the epithelial airway barrier and advanced microscopic techniques we have been able to visualize and detect nanoparticles within single cells. With this *in vitro* system we clearly show how dendritic cells gain access to the apical side of the epithelial cells (i.e. the luminal side of the lung) where they may sample particulate antigens and interact with airway macrophages. We conclude that dendritic cells and macrophages build a transepithelial interacting surveillance network.

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